component, the feedstock contacting the catalyst at an inlet temperature of from 500 to 600°C and being passed over the catalyst at an LHSV of from 10 to $30h^{-1}$, the feedstock and the effluent having substantially the same olefin content by weight therein [as], and the effluent having a higher propylene content than the feedstock.

A1

Amend Claim 24 to read:

24 (Amended). A process according to claim [21] 1, wherein the catalyst has been pre-treated so as to increase the silicon\aluminium atomic ratio thereof by heating the catalyst in steam and de-aluminating the catalyst by treating the catalyst with a complexing agent for aluminium.

A2

REMARKS

Claims 1-26 are rejected under 35 USC §103. The Applicants respectfully traverse these rejections and request reconsideration of the application in view of the above amendments and the following remarks.

Claims 1 and 24 have been amended. None of these changes constitute new matter since this clarification of the claims is supported by the original disclosure.

Claims 1-15 were rejected under 35 USC §103(a) as being unpatentable over EP0109060. Specifically, the Office Action suggests that EP 0109060 discloses a process of cracking a hydrocarbon feed of olefins into propylene and ethylene.

Claims 16-23 were rejected under 35 USC §103(a) as being unpatentable over EP0109060 in view of Cosyns. Specifically, the Office Action suggests that while EP 0109060 does not discloses that the feed contains diene and hydrogenation of diene, Cosyns discloses a hydrogenation process for diene.

Claims 24-26 were rejected under 35 USC §103(a) as being unpatentable over EP0109060 or, in the alternative, over EP0109060 in view of Cosyns and Gajda. Specifically, the Office Action suggests that while EP 0109060 does not discloses pre-treating the catalyst by steam and de-aluminating to increase the silicon/aluminum ratio, such a step would have been obvious to a person having ordinary skill in the art or, in the alternative, is disclosed by Gajda.

It is noted that though Claim 27 was included in the "Office Action Summary" as being rejected, there was no rejection for Claim 27 addressed in the "Detailed Action". If Claim 27 is rejected, the Applicants respectfully request the rejection be specified, the references upon which the rejection is based be cited and the reasoning for the rejection be explained. The Applicants further request the opportunity to respond to a rejection for Claim 27 before final action is taken on this application.

Claim 1 has been amended. Claim 1 now reads in part "a crystalline silicate catalyst having a silicon/aluminum atomic ratio of from 180 to 1000 to produce an effluent having a second composition of at least one olefinic component, the feedstock

contacting the catalyst at an inlet temperature of from 500 to 600°C and being passed over the catalyst at an LHSV of from 10 to $30h^{-1}$". Support for this language is found on page 14, lines 27-28, page 13, page 31-33; and page 20, line 20. These changes in language have been made to Claim 1 to clarify the claimed subject matter.

Neither EP0109060, Cosyns nor Gajda, individually or in combination, teach, disclose or suggest a process having a crystalline silicate catalyst with a specific silicon/aluminium atomic ratio having both a lower limited of 180 and an upper limit of 1000 in combination with a specific inlet temperature range of from 500 to 600°C and a specific LHSV range of from 10 to $30h^{-1}$. Much broader ranges are disclosed in EP-0109060.

EP-0109060 discloses a silica/alumina molar ratio equal to or greater than 350, which corresponds to a silicon/aluminium atomic ratio of equal to or greater than 175. There is no disclosure or even suggestion in EP-0109060 of an upper limit for that silica/alumina molar ratio. In fact, as is immediately apparent from the Examples, in particular Examples 3, 4, 8, 14-25 and 32-35 as shown in the Tables, EP-0109060 only exemplifies silica/alumina molar ratios of infinity. The range defined in amended Claim 1 is accordingly defined narrowly compared to the actual open-ended range disclosed in EP-0109060.

It has been found that by selecting a silicon/aluminium atomic ratio of from 180 to 1000, in combination with the specific inlet temperature and LHSV ranges recited in Claim 1, a high propylene yield can be obtained over a significant period of time. Silicon/aluminium atomic ratios outside the range tend to reduce the durability of the catalyst over time as a result of, for example, the formation of coke on the catalyst, as shown in Example 5.

The selected range for the silicon/aluminium atomic ratio of from 180 to 1000 could not have been derived by a person of ordinary skill in the art from EP-0109060 without undue experimentation. In fact, all of the Examples of EP-0109060 direct the person of ordinary skill in the art to using silicon/aluminium atomic ratios of infinity, and thus away from the invention. It is accordingly submitted that nothing in that cited reference discloses, teaches or suggests the particular silicon/aluminium atomic ratio range required by Claim 1, most particularly in combination with the particular inlet temperature range and the particular LHSV range. The mere fact that the prior art could be modified does not make the modification obvious unless the prior art suggested the desirability of the modification. There is no suggestion in EP-0109060 of the desirability or incentive to use a silicon/aluminum atomic ratio of from 180 to 1000 instead of a silicon/aluminum atomic ratio of up to infinity, especially in combination with an inlet temperature of from 500 to 600°C and an LHSV of from 10 to $30h^{-1}$.

With regard to the inlet temperature, the inlet temperature range claimed of from 500 to 600°C is narrower than that disclosed in the cited reference. While the examples of the cited reference employ a temperature falling within the range claimed in amended Claim 1, there is no disclosure or suggestion in the cited reference of the specific combination of silicon/aluminium atomic ratio, space velocity and temperature now required by Claim 1 as amended.

With regard to the space velocity, the cited reference discloses a weight space velocity of 5 to 200 kg/h which is a much broader range than the LHSV range of from 10 to $30h^{-1}$ required by the amended Claim 1. The present inventors have found that by using a space velocity within the range claimed this ensures good propylene yield. None of the Examples of the cited reference employing silicalite-1 as the catalyst employs a space velocity falling within the claimed range.

Even if a prima facie case of obviousness were established, the unexpected results disclosed in the present application would satisfy the requirements of patentability. The Examiner's attention is respectfully directed to pages 31-32, Example 5, page 60, and Table 11, wherein silicon/aluminum atomic ratios outside the claimed range were not as effective in increasing propylene yield and formed coke on the catalyst which would result in poor stability (page 31, lines 25-29). The same results are shown on pages 41-42, Example 16, and Figure 9 wherein catalysts having

silicon/aluminum atomic ratios outside the claimed range were not as effective in increasing propylene yield. In addition, it is noted that where the catalyst has been pre-treated by steaming and de-aluminating as specified in Claim 24 the silicon/aluminum atomic ratio need only be greater than 180 rather than at least 300 for an untreated catalyst (page 41, line 32, through page 42, line 5). Also, having an olefin partial pressure from 0.1 to 2 bars as specified in Claim 13 produces advantageous results. In Example 6, page 32, line 12, through page 33, line 14, and Table 12, page 61, there is a higher propylene yield and lower parafin and heavy compound (C_6+) for the run at 1.2 bara over the run at 3 bara.

There is no disclosure or suggestion that such unexpected results could be realized by a process for cracking an olefin-rich hydrocarbon feedstock with a crystalline silicate catalyst having a silicon/aluminum atomic ratio of from 180 to 1000, an inlet temperature of from 500 to 600°C and an LHSV of from 10 to 30h^{-1}. Even if the ranges may fall with the general disclosures of the cited references, the claimed invention distinguishes the specified ranges by producing unexpected benefits from the combination of these process conditions, e.g. silicon/ aluminum atomic ratio, inlet temperature and space velocity.

A Petition and Fee for Extension of Time under 37 CFR §1.136(a) is being filed concurrently with this response. The Commissioner is hereby authorized to charge any fees due by filing this paper or to credit any overpayment to Account No. 03-3345.

On the basis of the above amendments and remarks, reconsideration of this application is requested and its allowance requested at the Examiner's earliest convenience. No new matter has been added.

Respectfully submitted,

Jim Wheelington
Reg. No. 33,051

Fina Technology, Inc.
P.O. Box 410
Dallas, Texas 75221
(972) 801-2971

I HEREBY CERTIFY THAT THIS CORRESPONDENCE OR FEE IS BEING DEPOSITED WITH THE U.S. POSTAL SERVICE AS FIRST CLASS MAIL, IN AN ENVELOPE ADDRESSED TO: COMMISSIONER OF PATENTS & TRADEMARKS, WASHINGTON, DC 20231
ON Dec. 20, 1999

JANIS DAVIDSON
Name

Janis Davidson
Signature

December 20, 1999
Date of Signature